

WO 00/17233

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09/806080

SEQUENCE LISTING

<110> Jomaa, Hassan

<120> Genes of the 1-deoxy-D-xylulose biosynthesis pathway

<130> 15696

<140> PCT/EP99

<141> 1999-09-22

<150> DE19923567.8

<151> 1999-05-22

<150> DE19843279.8

<151> 1998-09-22

<160> 6

<170> PatentIn Ver. 2.1

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<213> Plasmodium falciparum

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Asp	Asn	Lys	Ile	Thr	Lys	Ser	Arg	Arg	Cys	Lys	Arg	Ile	Lys	Leu	Cys		
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tta cca gaa tat ttg tgt ata cat gat aaa agt gta tat gaa gaa tta Leu Pro Glu Tyr Leu Cys Ile His Asp Lys Ser Val Tyr Glu Glu Leu 130 135 140	432
aaa gaa ctg gta aaa aat ata aaa gat tat aaa cct ata ata ttg tgt Lys Glu Leu Val Lys Asn Ile Lys Asp Tyr Lys Pro Ile Ile Leu Cys 145 150 155 160	480
ggg gat gaa ggg atg aaa gaa ata tgt agt agt aat agt ata gat aaa Gly Asp Glu Gly Met Lys Glu Ile Cys Ser Ser Asn Ser Ile Asp Lys 165 170 175	528
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gca att atg aat aat aaa ata gtt gcg tta gct aat aaa gaa tcc att Ala Ile Met Asn Asn Lys Ile Val Ala Leu Ala Asn Lys Glu Ser Ile 195 200 205	624
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Phe Leu Phe Asp Val Asp Tyr Asn Asp Ile Glu Val Ile Val His Lys
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Glu Cys Ile Ile His Ser Cys Val Glu Phe Ile Asp Lys Ser Val Ile
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Gln Val Ser Thr Leu Thr Phe His Lys Pro Ser Leu Glu His Phe Pro
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Cys Ile Lys Leu Ala Tyr Gln Ala Gly Ile Lys Gly Asn Phe Tyr Pro
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Asn Lys Ile Lys Tyr Phe Asp Ile Ser Ser Ile Ile Ser Gln Val Leu
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Glu Ser Phe Asn Ser Gln Lys Val Ser Glu Asn Ser Glu Asp Leu Met
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 Met Ile Phe Asn Tyr Val Phe Phe Lys Asn Phe Val Pro Val Val
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 Leu Tyr Ile Leu Ile Ile Tyr Ile Asn Leu Asn Gly Met Asn Asn
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aaa aat caa ata aaa aca gaa aaa att tat ata aag aaa ttg aat agg 266
 Lys Asn Gln Ile Lys Thr Glu Lys Ile Tyr Ile Lys Lys Leu Asn Arg
 35 40 45

ttg tca agg aaa aat tcg tta tgt agt tct aaa aat aaa ata gca tgc 314
 Leu Ser Arg Lys Asn Ser Leu Cys Ser Ser Lys Asn Lys Ile Ala Cys
 50 55 60

ttg ttc gat ata gga aat gat gat aat aga aat acg aca tat ggc tat 362
 Leu Phe Asp Ile Gly Asn Asp Asp Asn Arg Asn Thr Thr Tyr Gly Tyr
 65 70 75

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 Asn Val Asn Val Lys Asn Asp Asp Ile Asn Ser Leu Leu Lys Asn Asn
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 Ile Ser Thr Asn Lys Ile Ser Gly Ser Ile Ser Asn Ile Cys Ser Arg
 115 120 125

aat caa aaa gaa aat gaa caa aaa aga aat aaa caa aga tgt tta act 554
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 130 135 140

caca tgt cac act tat aat atg tca cat gaa cag gac aaa cta gct aat 602
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 160 165 170 175

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465	470	475
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Tyr Asp Asn Val Ile Tyr Asp Ile Gly His Gln Ala Tyr Val His Lys		
480	485	490
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Ile Leu Thr Gly Arg Lys Leu Leu Phe Leu Ser Leu Arg Asn Lys Lys		
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Gly Ile Ser Gly Phe Leu Asn Ile Phe Glu Ser Ile Tyr Asp Lys Phe		
515	520	525
ggg gct ggt cac agt tcc act tca tta agt gct ata caa gga tat tat		1754
Gly Ala Gly His Ser Ser Thr Ser Leu Ser Ala Ile Gln Gly Tyr Tyr		
530	535	540
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Glu Ala Glu Trp Gln Val Lys Asn Lys Glu Lys Tyr Gly Asn Gly Asp		
545	550	555
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Gln Lys Gly Ile His Asn Asp Asn Asn Ile Asn Asn Ile Asn Asn		
580	585	590
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Val Pro Asn Val Arg Asn Asp Asn His Asn Val Asp Lys Val His Ile		
610	615	620
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Ala Ile Ile Gly Asp Gly Gly Leu Thr Gly Gly Met Ala Leu Glu Ala		
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Leu Asn Tyr Ile Ser Phe Leu Asn Ser Lys Ile Leu Ile Ile Tyr Asn		
640	645	650
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Asp Asn Gly Gln Val Ser Leu Pro Thr Asn Ala Val Ser Ile Ser Gly		
660	665	670

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Glu Asn Asn Ile Phe Glu Asn Leu Asn Tyr Asp Tyr Ile Gly Val Val		
705	710	715
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740	745	750
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785	790	795
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850	855	860
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Ile Ser Glu Arg Tyr Pro Asn Asn Val Tyr Asp Val Gly Ile Ala Glu		
865	870	875
caa cat tct gta act ttc gca gca gct atg gca atg aat aag aaa tta		2810
Gln His Ser Val Thr Phe Ala Ala Met Ala Met Asn Lys Lys Leu		
880	885	890
895		

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tct cca agt aat caa gtt gat ttg aaa aga gct ctt agg ttt gct tat Ser Pro Ser Asn Gln Val Asp Leu Lys Arg Ala Leu Arg Phe Ala Tyr 960 965 970 975	3050
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gag agc aaa aat atc gat gta aac gtg gat ata aac gat gat gta gat Glu Ser Lys Asn Ile Asp Val Asn Val Asp Ile Asn Asp Asp Val Asp 1010 1015 1020	3194
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att gga aaa tct aga att att aaa atg gat aat gaa aat aat aat aca Ile Gly Lys Ser Arg Ile Ile Lys Met Asp Asn Glu Asn Asn Asn Thr 1040 1045 1050 1055	3290
aat gaa cat tat tca agc aga gga gat aca cag aca aaa aaa aaa Asn Glu His Tyr Ser Ser Arg Gly Asp Thr Gln Thr Lys Lys Lys 1060 1065 1070	3338
gtt tgt atc ttt aac atg ggt agt atg ctt ttt aat gta att aat gct Val Cys Ile Phe Asn Met Gly Ser Met Leu Phe Asn Val Ile Asn Ala 1075 1080 1085	3386
ata aaa gaa att gaa aaa gaa caa tat att tca cat aat tat tct ttt Ile Lys Glu Ile Glu Lys Glu Gln Tyr Ile Ser His Asn Tyr Ser Phe 1090 1095 1100	3434
tca att gtt gat atg ata ttt tta aat cct tta gat aaa aat atg ata Ser Ile Val Asp Met Ile Phe Leu Asn Pro Leu Asp Lys Asn Met Ile 1105 1110 1115	3482

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gat cat gta ata aaa caa aat aaa cat caa tat tta att act tat gaa		3530
Asp His Val Ile Lys Gln Asn Lys His Gln Tyr Leu Ile Thr Tyr Glu		
1120 1125 1130 1135		
gat aat act ata ggt ggt ttt tct aca cat ttc aat aat tat tta ata		3578
*Asp *Asn *Thr Ile Gly Gly Phe Ser Thr His Phe Asn Asn Tyr Leu Ile		
1140 1145 1150		
gaa aat aat tat att aca aaa cat aac tta tat gtt cat aat att tat		3626
Glu Asn Asn Tyr Ile Thr Lys His Asn Leu Tyr Val His Asn Ile Tyr		
1155 1160 1165		
tta tct aat gag cca att gaa cat gca tct ttt aag gat caa caa gaa		3674
Leu Ser Asn Glu Pro Ile Glu His Ala Ser Phe Lys Asp Gln Gln Glu		
1170 1175 1180		
gtc gtc aaa atg gat aaa tgt agt ctt gtc aat aga att aaa aat tat		3722
Val Val Lys Met Asp Lys Cys Ser Leu Val Asn Arg Ile Lys Asn Tyr		
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Leu Lys Asn Asn Pro Thr		
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Ser Arg Lys Asn Ser Leu Cys Ser Ser Lys Asn Lys Ile Ala Cys Leu		
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Phe Asp Ile Gly Asn Asp Asp Asn Arg Asn Thr Thr Tyr Gly Tyr Asn		
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Ser Asn Lys Leu Tyr Met Asp Lys Arg Lys Asn Ile Asn Asn Val Ile		
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Ser Thr Asn Lys Ile Ser Gly Ser Ile Ser Asn Ile Cys Ser Arg Asn		
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- 12 -

Gln Lys Glu Asn Glu Gln Lys Arg Asn Lys Gln Arg Cys Leu Thr Gln
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Cys His Thr Tyr Asn Met Ser His Glu Gln Asp Lys Leu Ala Asn Asp
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Asn Asn Arg Asn Asn Lys Lys Asn Phe Asn Leu Leu Phe Ile Asn Tyr
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Phe Asn Leu Lys Arg Met Lys Asn Ser Leu Leu Asn Lys Asp Asn Phe
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Phe Tyr Cys Lys Glu Lys Lys Leu Ser Phe Leu His Lys Ala Tyr Lys
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210 215 220

Arg Asp Ser His Lys Leu Phe Ser Gly Glu Phe Asp Asp Tyr Thr Asn
225 230 235 240

Asn Asn Ala Leu Tyr Glu Ser Glu Lys Lys Glu Tyr Ile Thr Leu Asn
245 250 255

Asn Asn Asn Lys Asn Asn Asn Lys Asn Asn Asp Asn Lys Asn Asn
260 265 270

Asp Asn Asn Asp Tyr Asn Asn Asn Ser Cys Asn Asn Leu Gly Glu
275 280 285

Arg Ser Asn His Tyr Asp Asn Tyr Gly Gly Asp Asn Asn Asn Pro Cys
290 295 300

Asn Asn Asn Asn Asp Lys Tyr Asp Ile Gly Lys Tyr Phe Lys Gln Ile
305 310 315 320

Asn Thr Phe Ile Asn Ile Asp Glu Tyr Lys Thr Ile Tyr Gly Asp Glu
325 330 335

Ile Tyr Lys Glu Ile Tyr Glu Leu Tyr Val Glu Arg Asn Ile Pro Glu
340 345 350

Tyr Tyr Glu Arg Lys Tyr Phe Ser Glu Asp Ile Lys Lys Ser Val Leu
355 360 365

Phe Asp Ile Asp Lys Tyr Asn Asp Val Glu Phe Glu Lys Ala Ile Lys
370 375 380

Glu Glu Phe Ile Asn Asn Gly Val Tyr Ile Asn Asn Ile Asp Asn Thr
385 390 395 400

Tyr Tyr Lys Lys Glu Asn Ile Leu Ile Met Lys Lys Ile Leu His Tyr
405 410 415

Phe Pro Leu Leu Lys Leu Ile Asn Asn Pro Ser Asp Leu Lys Lys Leu
420 425 430

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Lys Lys Gln Tyr Leu Pro Leu Leu Ala His Glu Leu Lys Ile Phe Leu
435 440 445

Phe Phe Ile Val Asn Ile Thr Gly Gly His Phe Ser Ser Val Leu Ser
450 455 460

Ser Leu Glu Ile Gln Leu Leu Leu Tyr Ile Phe Asn Gln Pro Tyr
465 470 475 480

Asp Asn Val Ile Tyr Asp Ile Gly His Gln Ala Tyr Val His Lys Ile
485 490 495

Leu Thr Gly Arg Lys Leu Leu Phe Leu Ser Leu Arg Asn Lys Lys Gly
500 505 510

Ile Ser Gly Phe Leu Asn Ile Phe Glu Ser Ile Tyr Asp Lys Phe Gly
515 520 525

Ala Gly His Ser Ser Thr Ser Leu Ser Ala Ile Gln Gly Tyr Tyr Glu
530 535 540

Ala Glu Trp Gln Val Lys Asn Lys Glu Lys Tyr Gly Asn Gly Asp Ile
545 550 555 560

Glu Ile Ser Asp Asn Ala Asn Val Thr Asn Asn Glu Arg Ile Phe Gln
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Lys Gly Ile His Asn Asp Asn Asn Ile Asn Asn Asn Ile Asn Asn Asn
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Asn Tyr Ile Asn Pro Ser Asp Val Val Gly Arg Glu Asn Thr Asn Val
595 600 605

Pro Asn Val Arg Asn Asp Asn His Asn Val Asp Lys Val His Ile Ala
610 615 620

Ile Ile Gly Asp Gly Gly Leu Thr Gly Gly Met Ala Leu Glu Ala Leu
625 630 635 640

Asn Tyr Ile Ser Phe Leu Asn Ser Lys Ile Leu Ile Ile Tyr Asn Asp
645 650 655

Asn Gly Gln Val Ser Leu Pro Thr Asn Ala Val Ser Ile Ser Gly Asn
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Arg Pro Ile Gly Ser Ile Ser Asp His Leu His Tyr Phe Val Ser Asn
675 680 685

Ile Glu Ala Asn Ala Gly Asp Asn Lys Leu Ser Lys Asn Ala Lys Glu
690 695 700

Asn Asn Ile Phe Glu Asn Leu Asn Tyr Asp Tyr Ile Gly Val Val Asn
705 710 715 720

Gly Asn Asn Thr Glu Glu Leu Phe Lys Val Leu Asn Asn Ile Lys Glu
725 730 735

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Asn Lys Leu Lys Arg Ala Thr Val Leu His Val Arg Thr Lys Lys Ser
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Asn Asp Phe Ile Asn Ser Lys Ser Pro Ile Ser Ile Leu His Ser Ile
755 760 765

Lys Lys Asn Glu Ile Phe Pro Phe Asp Thr Thr Ile Leu Asn Gly Asn
770 775 780

Ile His Lys Glu Asn Lys Ile Glu Glu Glu Lys Asn Val Ser Ser Ser
785 790 795 800

Thr Lys Tyr Asp Val Asn Asn Lys Asn Asn Asn Asp Asn Ser
805 810 815

Glu Ile Ile Lys Tyr Glu Asp Met Phe Ser Lys Glu Thr Phe Thr Asp
820 825 830

Ile Tyr Thr Asn Glu Met Leu Lys Tyr Leu Lys Lys Asp Arg Asn Ile
835 840 845

Ile Phe Leu Ser Pro Ala Met Leu Gly Gly Ser Gly Leu Val Lys Ile
850 855 860

Ser Glu Arg Tyr Pro Asn Asn Val Tyr Asp Val Gly Ile Ala Glu Gln
865 870 875 880

His Ser Val Thr Phe Ala Ala Ala Met Ala Met Asn Lys Lys Leu Lys
885 890 895

Ile Gln Leu Cys Ile Tyr Ser Thr Phe Leu Gln Arg Ala Tyr Asp Gln
900 905 910

Ile Ile His Asp Leu Asn Leu Gln Asn Ile Pro Leu Lys Val Ile Ile
915 920 925

Gly Arg Ser Gly Leu Val Gly Glu Asp Gly Ala Thr His Gln Gly Ile
930 935 940

Tyr Asp Leu Ser Tyr Leu Gly Thr Leu Asn Asn Ala Tyr Ile Ile Ser
945 950 955 960

Pro Ser Asn Gln Val Asp Leu Lys Arg Ala Leu Arg Phe Ala Tyr Leu
965 970 975

Asp Lys Asp His Ser Val Tyr Ile Arg Ile Pro Arg Met Asn Ile Leu
980 985 990

Ser Asp Lys Tyr Met Lys Gly Tyr Leu Asn Ile His Met Lys Asn Glu
995 1000 1005

Ser Lys Asn Ile Asp Val Asn Val Asp Ile Asn Asp Asp Val Asp Lys
1010 1015 1020

Tyr Ser Glu Glu Tyr Met Asp Asp Asp Asn Phe Ile Lys Ser Phe Ile
025 1030 1035 1040

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Gly Lys Ser Arg Ile Ile Lys Met Asp Asn Glu Asn Asn Asn Thr Asn
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Glu His Tyr Ser Ser Arg Gly Asp Thr Gln Thr Lys Lys Lys Val
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Cys Ile Phe Asn Met Gly Ser Met Leu Phe Asn Val Ile Asn Ala Ile
 1075 1080 1085

Lys Glu Ile Glu Lys Glu Gln Tyr Ile Ser His Asn Tyr Ser Phe Ser
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Ile Val Asp Met Ile Phe Leu Asn Pro Leu Asp Lys Asn Met Ile Asp
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His Val Ile Lys Gln Asn Lys His Gln Tyr Leu Ile Thr Tyr Glu Asp
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Asn Thr Ile Gly Gly Phe Ser Thr His Phe Asn Asn Tyr Leu Ile Glu
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Asn Asn Tyr Ile Thr Lys His Asn Leu Tyr Val His Asn Ile Tyr Leu
 1155 1160 1165

Ser Asn Glu Pro Ile Glu His Ala Ser Phe Lys Asp Gln Gln Glu Val
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Val Lys Met Asp Lys Cys Ser Leu Val Asn Arg Ile Lys Asn Tyr Leu
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tgcctgaata accacaaa atg agt tat ata aaa aga ctg att ctt ttt atg 231
 Met Ser Tyr Ile Lys Arg Leu Ile Leu Phe Met
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tta ctg ttt tat tct cat gta aaa att aaa aaa tta ttt att aaa att 279
 Leu Leu Phe Tyr Ser His Val Lys Ile Lys Lys Leu Phe Ile Lys Ile
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- 16 -

tct aat gta aac ata ttt ttt gca gaa gca aag aaa aat gga aaa aag			327
Ser Asn Val Asn Ile Phe Phe Ala Glu Ala Lys Lys Asn Gly Lys Lys			
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gaa ttc ttt ctt ttt tta cta aat ata aaa aaa aat agc caa cag aaa			375
Glu Phe Phe Leu Phe Leu Leu Asn Ile Lys Lys Asn Ser Gln Gln Lys			
45	50	55	
aaa act tat cat att acc aaa agg aat acc ata aat aaa agt gat ttt			423
Lys Thr Tyr His Ile Thr Lys Arg Asn Thr Ile Asn Lys Ser Asp Phe			
60	65	70	75
tta tat tct tta cta aat gaa gaa ggg aat tct tca aaa aag gaa tat			471
Leu Tyr Ser Leu Leu Asn Glu Glu Gly Asn Ser Ser Lys Lys Glu Tyr			
80	85	90	
aaa aat tta aaa gat gaa gaa aaa tat aat atc ata caa aat ata aaa			519
Lys Asn Leu Lys Asp Glu Glu Lys Tyr Asn Ile Ile Gln Asn Ile Lys			
95	100	105	
aaa tat tgt gaa tgt act aaa aaa tat aaa agg ctc cca aca cga gaa			567
Lys Tyr Cys Glu Cys Thr Lys Lys Tyr Lys Arg Leu Pro Thr Arg Glu			
110	115	120	
gta gtt att gga aat gtt aaa att gga gga aat aat aa aata gct att			615
Val Val Ile Gly Asn Val Lys Ile Gly Gly Asn Asn Lys Ile Ala Ile			
125	130	135	
caa act atg gct agc tgt gat aca aga aat gta gaa gaa tgt gta tat			663
Gln Thr Met Ala Ser Cys Asp Thr Arg Asn Val Glu Glu Cys Val Tyr			
140	145	150	155
caa att aga aaa tgt aaa gat ttg ggt gct gac att gta agg ttg act			711
Gln Ile Arg Lys Cys Lys Asp Leu Gly Ala Asp Ile Val Arg Leu Thr			
160	165	170	
gtt caa gga gtt caa gaa gca caa gct agt tat cat att aaa gaa aaa			759
Val Gln Gly Val Gln Glu Ala Gln Ala Ser Tyr His Ile Lys Glu Lys			
175	180	185	
tta tta tct gaa aat gta aat atc cca tta gta gca gat att cat ttt			807
Leu Leu Ser Glu Asn Val Asn Ile Pro Leu Val Ala Asp Ile His Phe			
190	195	200	
aat cct aaa ata gct tta atg gca gct gat gtg ttt gaa aaa att cga			855
Asn Pro Lys Ile Ala Leu Met Ala Ala Asp Val Phe Glu Lys Ile Arg			
205	210	215	
gtg aat cca gga aat tat gtt gat gga aga aaa aaa tgg ata gat aaa			903
Val Asn Pro Gly Asn Tyr Val Asp Gly Arg Lys Lys Trp Ile Asp Lys			
220	225	230	235
gtt tat aaa aot aaa gaa gaa ttt gat gaa ggg aaa tta ttt ata aaa			951
Val Tyr Lys Thr Lys Glu Glu Phe Asp Glu Gly Lys Leu Phe Ile Lys			
240	245	250	

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gaa aaa ttt gta cca tta att gaa aaa tgt aaa aga tta aat aga gca	999
Glu Lys Phe Val Pro Leu Ile Glu Lys Cys Lys Arg Leu Asn Arg Ala	
255 260 265	
ata aga att gga aca aat cat gga tcc ctt tca tct cga gta tta tca	1047
Ile Arg Ile Gly Thr Asn His Gly Ser Leu Ser Arg Val Leu Ser	
270 275 280	
tat tat gga gat aca cca tta ggt atg gta gaa tcg gct ttt gag ttt	1095
Tyr Tyr Gly Asp Thr Pro Leu Gly Met Val Glu Ser Ala Phe Glu Phe	
285 290 295	
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Ser Asp Leu Cys Ile Glu Asn Asn Phe Tyr Asn Leu Val Phe Ser Met	
300 305 310 315	
aaa gct tct aat gct tat gtt atg ata caa tct tat aga tta tta gta	1191
Lys Ala Ser Asn Ala Tyr Val Met Ile Gln Ser Tyr Arg Leu Leu Val	
320 325 330	
tct aaa caa tat gaa aga aat atg atg ttc cct ata cat tta gga gtt	1239
Ser Lys Gln Tyr Glu Arg Asn Met Met Phe Pro Ile His Leu Gly Val	
335 340 345	
aca gaa gca gga ttt ggt gat aat gga aga ata aaa tct tat tta ggt	1287
Thr Glu Ala Gly Phe Gly Asp Asn Gly Arg Ile Lys Ser Tyr Leu Gly	
350 355 360	
ata gga tct tta tta tat gat ggt ata gga gat acc att cgt ata tcc	1335
Ile Gly Ser Leu Leu Tyr Asp Gly Ile Gly Asp Thr Ile Arg Ile Ser	
365 370 375	
tta aca gaa gat cct tgg gaa gag tta act cct tgt aaa aaa tta gtt	1383
Leu Thr Glu Asp Pro Trp Glu Glu Leu Thr Pro Cys Lys Lys Leu Val	
380 385 390 395	
gaa aat tta aag aaa aga ata ttt tat aat gaa aat ttt aaa gaa gat	1431
Glu Asn Leu Lys Lys Arg Ile Phe Tyr Asn Glu Asn Phe Lys Glu Asp	
400 405 410	
aat gaa tta aaa aat aat gaa atg gat acc aaa aat cta tta aat ttt	1479
Asn Glu Leu Lys Asn Asn Glu Met Asp Thr Lys Asn Leu Leu Asn Phe	
415 420 425	
gaa gaa aat tat cga aat ttt aat aat ata aaa aaa aga aat gta gaa	1527
Glu Glu Asn Tyr Arg Asn Phe Asn Asn Ile Lys Lys Arg Asn Val Glu	
430 435 440	
aaa aat aat aat gta tta cat gaa gag tgc act äta ggt aat gta gta	1575
Lys Asn Asn Asn Val Leu His Glu Glu Cys Thr Ile Gly Asn Val Val	
445 450 455	
acc ata aaa gag tta gaa gat tct ctg caa att ttt aaa gat tta aat	1623
Thr Ile Lys Glu Leu Glu Asp Ser Leu Gln Ile Phe Lys Asp Leu Asn	
460 465 470 475	

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tta gaa gta gat tca aat gga aat ttg aaa aag gga gcc aaa aca act		1671	
Leu Glu Val Asp Ser Asn Gly Asn Leu Lys Lys Gly Ala Lys Thr Thr			
480	485	490	
gat atg gtt att ata aat gat ttt cat aat ata aca aat tta gga aaa		1719	
'Asp Met Val Ile Ile Asn Asp Phe His Asn Ile Thr Asn Leu Gly Lys			
495	500	505	
aaa act gtg gat aaa tta atg caa gtg gga att aat ata gta gtt caa		1767	
Lys Thr Val Asp Lys Leu Met Gln Val Gly Ile Asn Ile Val Val Gln			
510	515	520	
tat gaa cca cat aat ata gaa ttt ata gaa aaa atg gaa cca aat aat		1815	
Tyr Glu Pro His Asn Ile Glu Phe Ile Glu Lys Met Glu Pro Asn Asn			
525	530	535	
gat aat aat aat aat aat aat aat aat aat tta ttt tat gtg gat		1863	
Asp Asn Asn Asn Asn Asn Asn Asn Ile Leu Phe Tyr Val Asp			
540	545	550	555
ata aaa aat att atg aac agt tca gaa aaa aat att aaa tta agt aat		1911	
Ile Lys Asn Ile Met Asn Ser Ser Glu Lys Asn Ile Lys Leu Ser Asn			
560	565	570	
tct aaa gga tat gga tta att tta aac gga aaa gaa gat ata caa acc		1959	
Ser Lys Gly Tyr Gly Leu Ile Leu Asn Gly Lys Glu Asp Ile Gln Thr			
575	580	585	
ata aaa aaa ata aaa gaa tta aat cgt cgt cct tta ttc att cta tta		2007	
Ile Lys Lys Ile Lys Glu Leu Asn Arg Arg Pro Leu Phe Ile Leu Leu			
590	595	600	
aaa tca gat aac ata tat gaa cat gta tta ata acc aga aga att aat		2055	
Lys Ser Asp Asn Ile Tyr Glu His Val Leu Ile Thr Arg Arg Ile Asn			
605	610	615	
gaa ctt tta caa tcc tta aat ata aat ata cct tat ata cat tat gtt		2103	
Glu Leu Leu Gln Ser Leu Asn Ile Asn Ile Pro Tyr Ile His Tyr Val			
620	625	630	635
gat att aat tca aac aat tat gat gat ata tta gtt aat tca aca tta		2151	
Asp Ile Asn Ser Asn Asn Tyr Asp Asp Ile Leu Val Asn Ser Thr Leu			
640	645	650	
tat gca gga agt ttt ttg atg gat tta atg ggg gat ggt ctt att gtt		2199	
Tyr Ala Gly Ser Cys Leu Met Asp Leu Met Gly Asp Gly Leu Ile Val			
655	660	665	
aac gta act aat gat gtt ctt aca aat aaa aaa aag ata gaa aca aaa		2247	
Asn Val Thr Asn Asp Val Leu Thr Asn Lys Lys Lys Ile Glu Thr Lys			
670	675	680	
tat gat gaa aaa gaa gaa gta gag gaa gag gga aac aat aaa gat att		2295	
Tyr Asp Glu Lys Glu Glu Val Glu Glu Gly Asn Asn Lys Asp Ile			
685	690	695	

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cat aga ctt ttg agc aga gtt gca tta aat tca ttt tta aca tta aat	2343
His Arg Leu Leu Ser Arg Val Ala Leu Asn Ser Phe Leu Thr Leu Asn	
700 705 710 715	
att tta caa gat aca aga ata cgt tta ttt aaa aca gat tat ata gcc	2391
Ile Leu Gln Asp Thr Arg Ile Arg Leu Phe Lys Thr Asp Tyr Ile Ala	
720 725 730	
tgc cca tct tgt gga aga act tta ttt aat ata caa gaa act act aaa	2439
Cys Pro Ser Cys Gly Arg Thr Leu Phe Asn Ile Gln Glu Thr Thr Lys	
735 740 745	
aaa att atg aaa tta aca ggg cac tta aaa ggc gtt aaa att gca gtc	2487
Lys Ile Met Lys Leu Thr Gly His Leu Lys Gly Val Lys Ile Ala Val	
750 755 760	
atg gga tgt att gtt aat ggt ata gga gaa atg gca gat gca cat ttt	2535
Met Gly Cys Ile Val Asn Gly Ile Gly Glu Met Ala Asp Ala His Phe	
765 770 775	
ggt tat gtt ggt agt gca cct aaa aaa att gat tta tat tat ggt aaa	2583
Gly Tyr Val Gly Ser Ala Pro Lys Lys Ile Asp Leu Tyr Tyr Gly Lys	
780 785 790 795	
gag tta gta gaa aga aat ata cct gag gaa gaa gct tgt gat aaa ttg	2631
Glu Leu Val Glu Arg Asn Ile Pro Glu Glu Glu Ala Cys Asp Lys Leu	
800 805 810	
ata gaa tta att aaa aaa cat aac aaa tgg aaa gat cca taaaattgaat	2680
Ile Glu Leu Ile Lys Lys His Asn Lys Trp Lys Asp Pro	
815 820	
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Phe Phe Ala Glu Ala Lys Lys Asn Gly Lys Lys Glu Phe Phe Leu Phe
35 40 45

Leu Leu Asn Ile Lys Lys Asn Ser Gln Gln Lys Lys Thr Tyr His Ile
50 55 60

Thr Lys Arg Asn Thr Ile Asn Lys Ser Asp Phe Leu Tyr Ser Leu Leu
65 70 75 80

Asn Glu Glu Gly Asn Ser Ser Lys Lys Glu Tyr Lys Asn Leu Lys Asp
85 90 95

Glu Glu Lys Tyr Asn Ile Ile Gln Asn Ile Lys Lys Tyr Cys Glu Cys
100 105 110

Thr Lys Lys Tyr Lys Arg Leu Pro Thr Arg Glu Val Val Ile Gly Asn
115 120 125

Val Lys Ile Gly Gly Asn Asn Lys Ile Ala Ile Gln Thr Met Ala Ser
130 135 140

Cys Asp Thr Arg Asn Val Glu Glu Cys Val Tyr Gln Ile Arg Lys Cys
145 150 155 160

Lys Asp Leu Gly Ala Asp Ile Val Arg Leu Thr Val Gln Gly Val Gln
165 170 175

Glu Ala Gln Ala Ser Tyr His Ile Lys Glu Lys Leu Leu Ser Glu Asn
180 185 190

Val Asn Ile Pro Leu Val Ala Asp Ile His Phe Asn Pro Lys Ile Ala
195 200 205

Leu Met Ala Ala Asp Val Phe Glu Lys Ile Arg Val Asn Pro Gly Asn
210 215 220

Tyr Val Asp Gly Arg Lys Lys Trp Ile Asp Lys Val Tyr Lys Thr Lys
225 230 235 240

Glu Glu Phe Asp Glu Gly Lys Leu Phe Ile Lys Glu Lys Phe Val Pro
245 250 255

Leu Ile Glu Lys Cys Lys Arg Leu Asn Arg Ala Ile Arg Ile Gly Thr
260 265 270

Asn His Gly Ser Leu Ser Ser Arg Val Leu Ser Tyr Tyr Gly Asp Thr
275 280 285

Pro Leu Gly Met Val Glu Ser Ala Phe Glu Phe Ser Asp Leu Cys Ile
290 295 300

Glu Asn Asn Phe Tyr Asn Leu Val Phe Ser Met Lys Ala Ser Asn Ala
305 310 315 320

Tyr Val Met Ile Gln Ser Tyr Arg Leu Leu Val Ser Lys Gln Tyr Glu

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325

330

335

Arg Asn Met Met Phe Pro Ile His Leu Gly Val Thr Glu Ala Gly Phe
340 345 350

Gly Asp Asn Gly Arg Ile Lys Ser Tyr Leu Gly Ile Gly Ser Leu Leu
355 360 365

Tyr Asp Gly Ile Gly Asp Thr Ile Arg Ile Ser Leu Thr Glu Asp Pro
370 375 380

Trp Glu Glu Leu Thr Pro Cys Lys Leu Val Glu Asn Leu Lys Lys
385 390 395 400

Arg Ile Phe Tyr Asn Glu Asn Phe Lys Glu Asp Asn Glu Leu Lys Asn
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Asn Glu Met Asp Thr Lys Asn Leu Leu Asn Phe Glu Glu Asn Tyr Arg
420 425 430

Asn Phe Asn Asn Ile Lys Lys Arg Asn Val Glu Lys Asn Asn Asn Val
435 440 445

Leu His Glu Glu Cys Thr Ile Gly Asn Val Val Thr Ile Lys Glu Leu
450 455 460

Glu Asp Ser Leu Gln Ile Phe Lys Asp Leu Asn Leu Glu Val Asp Ser
465 470 475 480

Asn Gly Asn Leu Lys Lys Gly Ala Lys Thr Thr Asp Met Val Ile Ile
485 490 495

Asn Asp Phe His Asn Ile Thr Asn Leu Gly Lys Lys Thr Val Asp Lys
500 505 510

Leu Met Gln Val Gly Ile Asn Ile Val Val Gln Tyr Glu Pro His Asn
515 520 525

Ile Glu Phe Ile Glu Lys Met Glu Pro Asn Asn Asp Asn Asn Asn Asn
530 535 540

Asn Asn Asn Asn Asn Ile Leu Phe Tyr Val Asp Ile Lys Asn Ile Met
545 550 555 560

Asn Ser Ser Glu Lys Asn Ile Lys Leu Ser Asn Ser Lys Gly Tyr Gly
565 570 575

Leu Ile Leu Asn Gly Lys Glu Asp Ile Gln Thr Ile Lys Lys Ile Lys
580 585 590

Glu Leu Asn Arg Arg Pro Leu Phe Ile Leu Leu Lys Ser Asp Asn Ile
595 600 605

Tyr Glu His Val Leu Ile Thr Arg Arg Ile Asn Glu Leu Leu Gln Ser
610 615 620

Leu Asn Ile Asn Ile Pro Tyr Ile His Tyr Val Asp Ile Asn Ser Asn
625 630 635 640

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Asn Tyr Asp Asp Ile Leu Val Asn Ser Thr Leu Tyr Ala Gly Ser Cys
645 650 655

Leu Met Asp Leu Met Gly Asp Gly Leu Ile Val Asn Val Thr Asn Asp
660 665 670

Val Leu Thr Asn Lys Lys Ile Glu Thr Lys Tyr Asp Glu Lys Glu
675 680 685

Glu Val Glu Glu Glu Gly Asn Asn Lys Asp Ile His Arg Leu Leu Ser
690 695 700

Arg Val Ala Leu Asn Ser Phe Leu Thr Leu Asn Ile Leu Gln Asp Thr
705 710 715 720

Arg Ile Arg Leu Phe Lys Thr Asp Tyr Ile Ala Cys Pro Ser Cys Gly
725 730 735

Arg Thr Leu Phe Asn Ile Gln Glu Thr Thr Lys Lys Ile Met Lys Leu
740 745 750

Thr Gly His Leu Lys Gly Val Lys Ile Ala Val Met Gly Cys Ile Val
755 760 765

Asn Gly Ile Gly Glu Met Ala Asp Ala His Phe Gly Tyr Val Gly Ser
770 775 780

Ala Pro Lys Lys Ile Asp Leu Tyr Tyr Gly Lys Glu Leu Val Glu Arg
785 790 795 800

Asn Ile Pro Glu Glu Ala Cys Asp Lys Leu Ile Glu Leu Ile Lys
805 810 815

Lys His Asn Lys Trp Lys Asp Pro
820